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EXAMINER	
AHMED, SHAMIM	
ART UNIT	PAPER NUMBER
1713	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/524,525	HAUSNER, MARTIN	
	Examiner	Art Unit	
	Shamim Ahmed	1713	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *5/3/10 & 5/4/10*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *24-45,47,49 and 50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *24-45,47,49 and 50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. As to 102(b), applicant's arguments with respect to claim 47 have been considered but are moot in view of the new ground(s) of rejection.

As to the 112, second paragraph, examiner noted that applicant fails to address the part of the rejection such as the narrower limitation of aluminum amount "more than 95%" in the broad limitation of "more than 90%". Therefore, the 112, 2nd paragraph rejection is repeated in this office action.

As to the 103(a) rejection, applicant argues that Ye et al is directed to etch aluminum form the surface of a work piece and not to etch a silicon-containing substrate as recited of each claims 24, 49 and 50 along with the claimed distance between the substrate and the ICP coil.

Applicant also argue that there is no teaching to incorporate the cylindrical coil shap of Ye et al.

In response, examiner states that the arguments are not persuasive because in the 103(a) rejection, the primary reference **Song et al** already teaches utilizing an inductively coupled plasma (ICP) etching silicon-containing layer using aluminum as a masking layer and **Ye et al** is introduced to show the ICP coil arrangement inside the plasma chamber or reactor for optimizing power deposition and also preventing unwanted changes in the plasma characeristics by utilizing any shape including cylindrical (see the rejection).

Examiner also pointed out that **Yin et al** teach the distance between the substrate and the ICP coil plays a major role in the plasma uniformity and one of ordinary skilled in the art at the time of claimed invention would have been motivated to combine such teaching into Song et al's etching process for maintaining the plasma uniformity (see the rejection for details).

Remarks

2. It is noted that the supplemental response of dated 5/4/10 with the claim 50 identified as "Currently Amended" is not properly identified as the claim 50 (Currently Amended) does not show any changes by underlining.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 47 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then

narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 47 recites the broad recitation "**more than 90%**", and the claim also recites "**more than 95%**" which is the narrower statement of the range/limitation.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 24-45 and 49-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Song et al (6,821,901) in view of Ye et al (6,270,687) and further in view of Yin et al (6,270,617).

Song et al disclose a silicon etching process utilizing an inductively coupled plasma etching through a masking layer of aluminum, wherein the etching is dry etching and the etching is performed in Bosch process such as etching and passivation steps are carried out alternatively (col.5, lines 50-col.6, line 7).

Song et al teach the etching create an etched cavity of about 250 μm deep (col.6, lines 7-9).

Song remains silent regarding the introduction of the inductively coupling power provided by an inductive coupling coil in the form of a cylinder and having a lower edge.

However, Ye et al teach several advantages over conventional inductively coupled plasma etch reactors by placing the inductive coil antenna within the chamber for preventing unwanted changes in the plasma characteristics and as well as optimizing power deposition , wherein the coil obviously having a lower edge as of figures 4A-4F (col.6, lines 57-67, col.7, lines 34-42 and col.12, lines 60-66).

Ye et al also teach that the coil related factors such as shape. Location and orientation which can be manipulated in an effort to optimize the power deposition and etchant species diffusion patterns within the chamber (col.13, lines 16-18). So, it would have been obvious to optimize the distance between the inductive coupling and the substrate.

Ye et al explicitly teach that the inductive coil could be any shape such as planner, dome-shape or **cylindrical** and they can be oriented or located within the chamber to achieve a desired power deposition pattern (col.7, lines 28-33) and also teach that the coil located interior of a reactor advantageous over the typical inductive coil wrapped around the exterior of the reactor (col.6, lines 57-63).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to employ Ye et al's teaching into Song et al's process for

preventing unwanted changes in the plasma characteristics and as well as optimizing power deposition as suggested by Ye et al.

Ye et al shows that a distance is maintained between the substrate and the lower edge of the coil (see figures 4A-4F), which would have been more than 8cm and easily reads on the limitation of at least 8 cm (the claimed lower range).

Additionally, Modified Song et al may differs from the instant invention in that the substrate is kept at a distance of at least twice the mean free path length of the plasma atoms or at least 8 cm from the inductive coupling.

However, Yin et al disclose a RF plasma reactor having induction coil above the substrate to be processed and also illustrate that **the distance between the substrate and the inductive coil provides major roles in the plasma uniformity by increasing the ion density across the wafer surface; the distance between the ceiling and the substrate is with in the range of 4-12 inches, which equates 10-30 cm** (col.1, lines 20-24 and col.2, lines 61-67), and the aforementioned reads on the claimed limitation of the substrate is kept at a distance from the inductive coupling---------- or at a distance of at least 8 cm from the inductive coupling.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to employ Yin et al's teaching into modified Song et al's process for producing uniform plasma on the surface regions as taught by Yin et al.

As to claim 26, Yin et al teach the pressure can be varied to control the ion distribution across the wafer surface and that could be about 10 mTorr or less than 20 mTorr (col.11, lines 44-53), which reads on the claim pressure range.

As to claim 27, depositing the material all the way across to the other side of the substrate is merely one of several obvious possibilities from which a person skilled in the art would select according to the circumstances as illustrates in Song et al

As to claim 30, Song et al teach that aluminum is vapor deposited by generally known method such as PVD (col.5, lines 19-21).

As to claims 49- 50, it would have been obvious to optimize the etched depth, which is dependent on the type of device to be formed.

2. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanabe et al (6,068,000) in view of Nakagawa et al (5,599,743).

Tanabe et al disclose an etching process for manufacturing fine circuits of a semiconductor device including the steps of forming a conductive metallic film of aluminum, copper or aluminum alloy, *resemble as the claimed mask material* and an insulation film such as SiO_2 on a substrate; the conductive metallic film and the insulation film are selectively etched using the resist pattern as a mask (col.1, lines 15-25) and aforesaid teaching easily reads on the limitation of *etching the substrate (wafer) in accordance with the desired selective removal of material from the surface of the wafer or substrate* as **Tanabe et al teach that the underlying layer of SiO_2 is etched according to the upper metallic layer with pattern, considering the insulation film SiO_2 is the surface of the substrate (wafer).**

Unlike the instant invention, **Tanabe et al** fails to teach the claimed amount of the content of the aluminum alloy.

However, Nakagawa et al teach a typical aluminum alloy primarily comprising aluminum, an alloy of aluminum with Si and or Cu is preferably used depending on the application during manufacturing a semiconductor device and the alloy may comprises 0.5 to 1 weight percent of silicon or the alloy could comprises copper in the range of 0.1-4 wt. percent and the aluminum content is more than 90% by weight or at least 95% by weight (col.3, lines 49-59).

It is noted that titanium content is optional in the aluminum alloy.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time of claimed invention to employ Nakagawa et al's teaching into Tanabe et al as the aluminum alloy content is typically known in the art and easily available as suggested by Nakagawa et al.

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on Mon-Thurs day (7:00-3:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Shamim Ahmed
Primary Examiner
Art Unit 1713

SA
July 10, 2010

/Shamim Ahmed/
Primary Examiner, Art Unit 1713